

# NPOESS Soil Moisture Satellite Data Assimilation and RFI Mitigation: Use of WindSat Data and a Discrete Backus-Gilbert Technique

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This work develops: (1) a four-dimensional data assimilation methodology to retrieve deep soil moisture profiles using the National Polar-orbiting Operational Environmental Satellite System (NPOESS) and other associated data, (2) a methodology for better spatial mapping of the masking effects caused by surface features (i.e. vegetative cover and surface roughness), and (3) a discrete Backus-Gilbert (DBG)-based methodology for reducing radio frequency interference impacts at 6.7 and 10 GHz.

Several case study data sets have been selected for analysis and will use the WindSat satellite data as a surrogate for NPOESS Conical-Scanning Microwave Imager/Sounder (CMIS) data. Sensitivity intercomparisons between the NPOESS CMIS simulation software and the CSU Microwave Land Surface Model (MWLSM) will be shown. This intercomparison work is an essential part of the testing and exercise of the NPOESS CMIS simulation software. The CSU system makes use of observed WindSat data and special US Army soil moisture data sets. The primary goal of this work is to identify paths to objective soil moisture performance (soil moisture at depths between 0-100 cm) for US Army use, and to identify and mitigate algorithm impediments to its potential performance.

Intercomparisons from the USAF Agricultural Meteorological Model (AGRMET) and the NOAA Global Data Assimilation System (GDAS) will also be presented. These models provide first guess information for the satellite soil moisture retrieval algorithms. An update of the 4DDA Regional Atmospheric Mesoscale Data Assimilation System (RAMDAS) research efforts will be presented, including recent system developments. The outcome of this work will be to extend satellite soil moisture information from the surface to deeper soil levels to more accurately determine its affect upon DoD-related trafficability, off-road mobility, counter-mine operations, and hydrological streamflow estimation.

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